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Occurrence of Upper Hypogean Trechine Beetles in Southwestern Hokkaido, Northeast Japan*

By

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It has been known that the trechine fauna of Hokkaido is considerably different from those of the three southern main islands of Japan (cf. UÉNO, 1982, pp. 72–75). It is characterized by the predominance of northern elements and the relatively low endemicity of the species involved. Anophthalmic species are localized on the Hidaka and the Yûbari Mountains (UÉNO, 1971) and the Oshima Peninsula (UÉNO, 1978), and are regarded as the descendants of two different ancestors that may have reached the respective areas across the sea by sweepstakes dispersal. All of them are endogean, having been found from under stones embedded in the ground in the alpine and/or subalpine zones.

Recently, two different species of trechine beetles with reduced eyes were discovered from the upper hypogean zone of the Oshima Peninsula at the southwestern part of Hokkaido. They are not particularly modified as compared with endogean forms, so that their occurrence in the deep zone below the soil mantle may be ascribed to the low elevation of the locality. However, their discovery deserves special mention, since it is the first record of anophthalmic trechines from the upper hypogean zone of the northern island.

One of the two species is a member of *Epaphiama*, a subgenus of *Epaphiopsis* already known in the peninsular area, but the other belongs to the genus *Oroblemus* hitherto recorded sporadically in the northeastern part of Honshu and the Island of Sado (UÉNO, 1983 a, b). The occurrence of the latter in southwestern Hokkaido can be regarded as one of the evidences that the Tsugaru Straits have not formed an impassable barrier to the dispersal of ground-living beetles. This subject will be taken up after the description of the new species.

In the present paper, the two upper hypogean trechines will be introduced into science, and a brief discussion will be made on their affinity and derivation. The abbreviations used herein are the same as those explained in other papers of mine (*e.g.*, UÉNO, 1978, p. 125).

Before going into further details, I wish to express my deep indebtedness to Professor Yoshiaki NISHIKAWA of Ohtemon-Gakuin University, Osaka, for his collaboration in the field investigations.

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Epaphiopsis (Epaphiama) nishikawai S. Uéno, sp. nov.

(Figs. 1–3)

Length: 3.70–4.05 mm (from apical margin of clypeus to apices of elytra).

Closely allied to *E. oligops* S. Uéno (1978, pp. 128, 140, figs. 10–12, 1985, p. 66, pl. 13, fig. 10) of the Sengen Mountains, with which it agrees in every detail excepting the features noted below.

A little smaller on an average and lighter in colour than *E. oligops*. Head as in *E. oligops*, but the eyes are usually more imperfect with degenerated ommatidia, usually about two-thirds as long as genae but sometimes only a half as long as the latter; antennae somewhat slenderer, usually reaching basal fourth of elytra. Pronotum a little longer on an average and usually

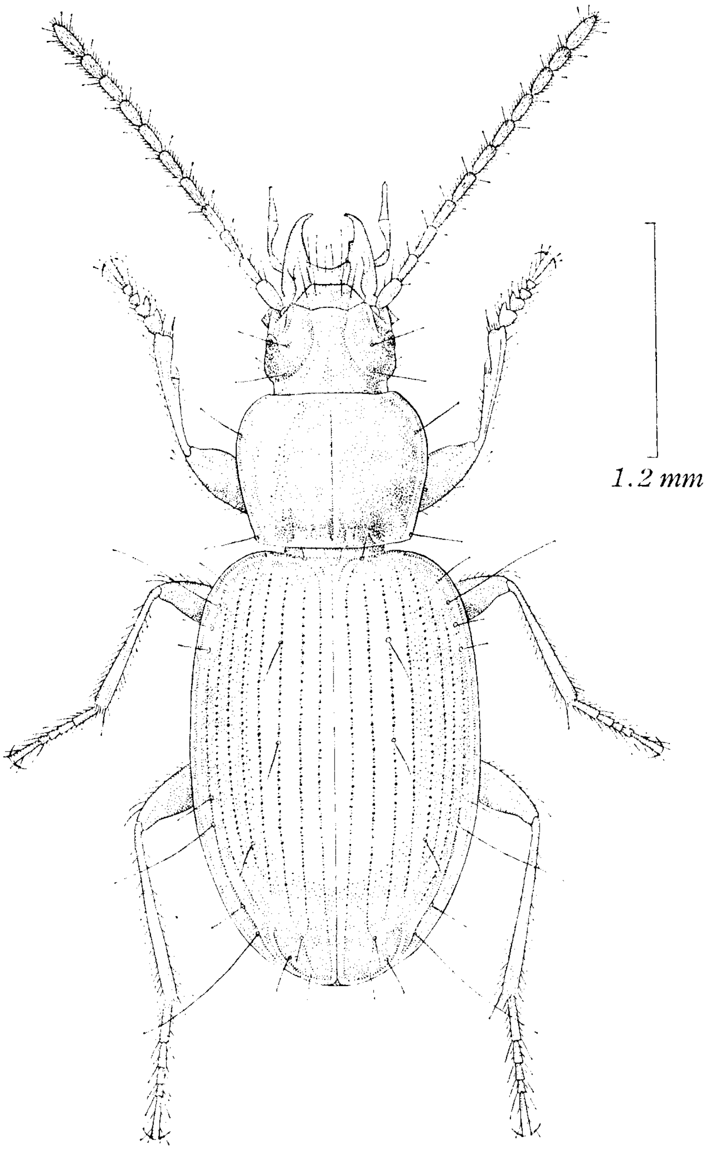
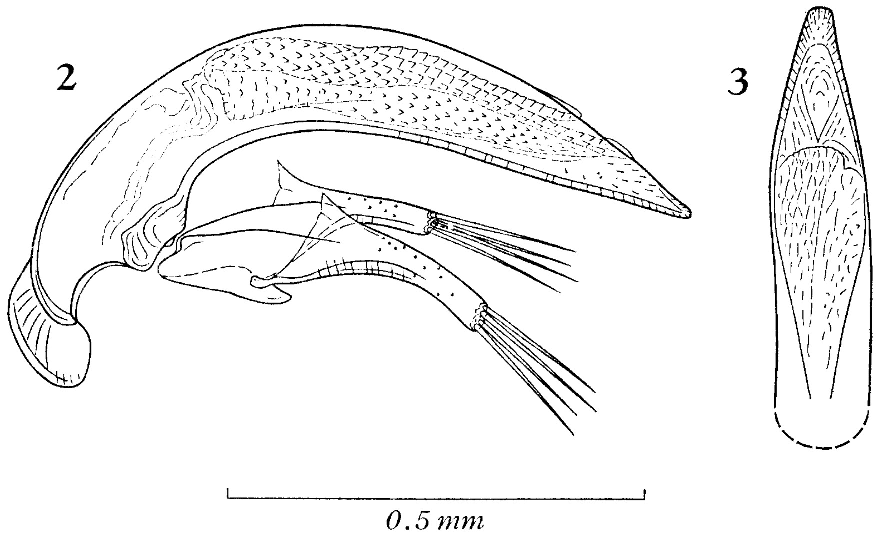


Fig. 1. *Epaphiopsis* (*Epaphiama*) *nishikawai* S. Uéno, sp. nov., ♂, from the Kumoishi-tôgé on the Oshima Mountains.



Figs. 2–3. Male genitalia of *Epaphiopsis* (*Epaphiama*) *nishikawai* S. Uéno, sp. nov., from the Kumoishi-tôgé on the Oshima Mountains; left lateral view (2), and apical part of aedeagus, dorsal view (3).

less contracted towards apex than in *E. oligops*, with the sides either straight behind middle or very slightly sinuate before hind angles; PW/HW 1.43–1.53 (M 1.47), PW/PL 1.15–1.24 (M 1.19), PW/PA 1.51–1.63 (M 1.58), PW/PB 1.17–1.24 (M 1.20), PB/PA 1.25–1.38 (M 1.31). Elytra broader at the bases and more parallel-sided, with more conspicuous shoulders and more strongly arcuate prehumeral borders; EW/PW 1.52–1.63 (M 1.58), EL/EW 1.43–1.53 (M 1.49); surface less convex, especially at the apical parts; sides more feebly arcuate, almost straight before middle; striae a little shallower than in *E. oligops*, though sharply impressed and coarsely punctate throughout.

Male genital organ similar to that of *E. oligops*, but smaller with longer aedeagal apical lobe. Aedeagus about one-third as long as elytra, elongate, arcuate and compressed; apical lobe obviously longer and more gradually narrowed towards the tip in dorsal view than in *E. oligops*; viewed dorsally, apex either very obtuse or subtruncated; other features as in *E. oligops*.

Type series. Holotype: ♂, allotype: ♀, 4–IX–1986, S. Uéno leg. Paratypes: 12♂♂, 7♀♀, 4–IX–1986, S. Uéno & Y. Nishikawa leg. All deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Kumoishi-tôgé, 260 m in altitude on the ENE slope, above Kaminamarigawa, in Yakumo-chô of the Oshima Peninsula, in southwestern Hokkaido, Northeast Japan.

Further specimens examined. 4♂♂, 2♀♀, Himemachi-tôgé, 480 m alt. at WSW side, in Otobé-chô, Oshima Pen., SW Hokkaido, 5–IX–1986, S. Uéno & Y. Nishikawa leg. (NSMT).

Notes. As is clearly demonstrated by the conformation of male genitalia, this new species is closely related to *E. oligops* and is considerably different from *E. alloligops* and *E. brevis*, though it is distributed in an area about a half way from the type locality of *E. oligops* to that of *E. alloligops*. Its type locality is a gully near Kaminamarigawa on the northeastern slope of the Kumoishi-tôgé, about 8.5 km east-southeast of Mt. Yûrappu-daké, and is about 68 km distant to the north by west from Mt. Nakasengen-daké, the type locality of *E. oligops*, and about 48 km distant to the south-southeast from Mt. Kariba-yama, that of *E. alloligops*. The gully is the head of one of the small branches of the Namari-gawa, a tributary of the Yûrappu-gawa River. It was so dimmed by deciduous broadleaved trees, that a head lamp was needed for finding out such small creatures as trechine beetles. They were always dug out from colluvia deposited near the water edges, usually from a depth of 20–30 cm but sometimes from a depth of more than 50 cm where the overlying soil mantle was relatively thick.

The Himemachi-tôgé specimens are identical in every external feature with the Kumoishi-tôgé ones, but are slightly different from the latter in the shape of aedeagal apical lobe, which is less obtuse and slightly reflexed at the extremity. For this reason, they are excluded from the type series. They were dug out from a colluvium at the side of a small gully on the southwestern slope of the pass, about 2.6 km west-northwest of Mt. Otobé-daké. This locality is about 19 km distant to the southeast in a bee-line from the habitat of the type specimens, or about 28 km distant from the latter if measured along the watershed ridge, and is about 53 km distant to the north by east from the type locality of *E. oligops*. The standard ratios in the six specimens examined are as follows: PW/HW 1.42–1.47 (M 1.45), PW/PL 1.17–1.24 (M 1.20), PW/PA 1.49–1.59 (M 1.53), PW/PB 1.17–1.24 (M 1.20), PB/PA 1.24–1.36 (M 1.28), EW/PW 1.59–1.63 (M 1.61), EL/EW 1.45–1.52 (M 1.49).

Oroblemus parvicollis S. Uéno, sp. nov.

(Figs. 4–6)

Length: 3.00 mm (from apical margin of clypeus to apices of elytra).

An isolated species readily recognized on its small prothorax sparsely covered with very short hairs but devoid of discal setae. It is further characterized by large head with short stout appendages, obliquely truncated lateral parts of pronotal base, presence of sparse pubescence ranged in an irregular longitudinal row on each elytral interval, and imperfectly grooved protibiae.

Body elongate, subparallel-sided and flattened, with large head and small prothorax; apterous. Colour uniformly light reddish brown, shiny, with mandibles and basal segments of antennae somewhat darker.

Head large and relatively long though still wider than long, with deep entire frontal furrows rather lightly arcuate in front and behind; surface almost glabrous though bearing a few, very short hairs; frons gently convex, supraorbital areas rather depressed; microsculpture sharply impressed, mostly consisting of isodiametric meshes and partially of wide ones; eyes small, completely flat and much degenerated, about four-fifths as long as genae, with vestiges of ommatidia and several minute hairs; genae gently and evenly convex, being covered with short erect hairs; neck very wide, with the anterior constriction distinct though not deep; labrum transverse and widely emarginate at the apex; mandibles short and stout; mentum imperfectly fused with submentum, the former bearing a large tooth in apical emargination, whose tip is widely truncated, the latter bearing a transverse row of ten setae; palpi short and

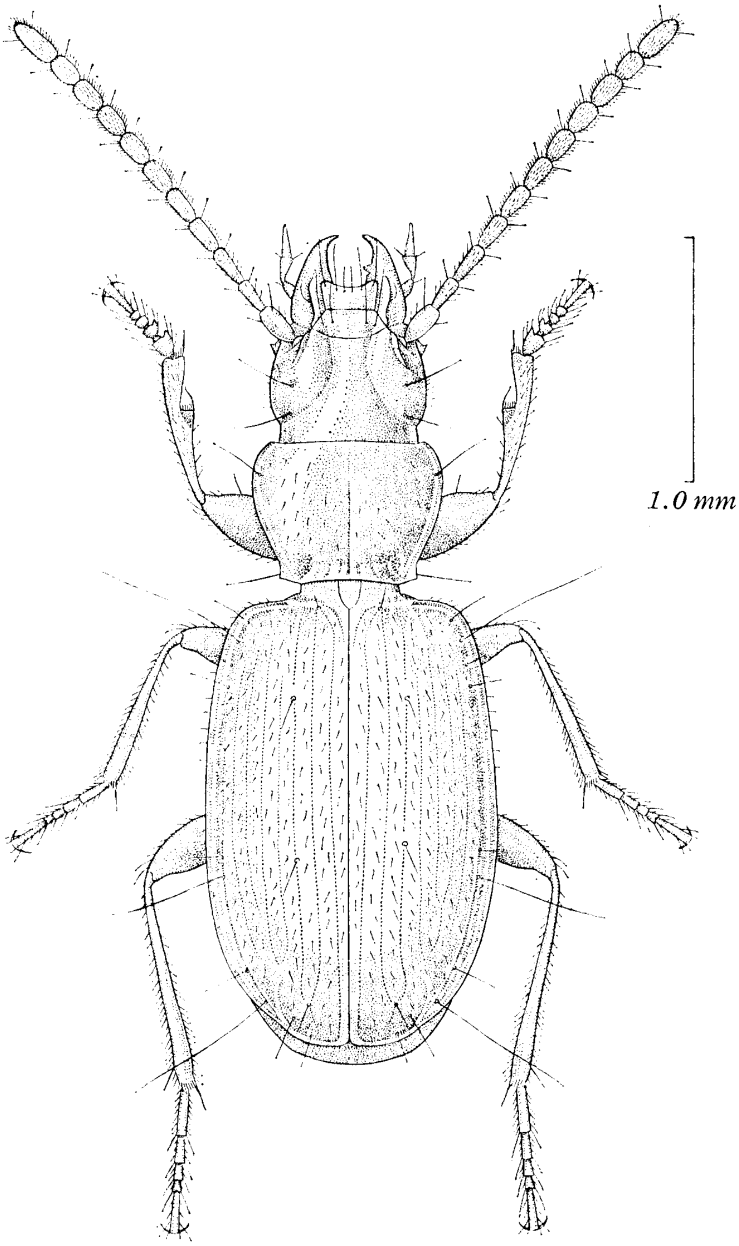


Fig. 4. *Oroblemus parvicollis* S. Uéno, sp. nov., ♂, from the Kumoishi-tôgé on the Oshima Mountains.

thick, penultimate segments very widely dilated towards apices, subtriangular and only 1.5 times as long as wide, apical segments conical; antennae short and stout, submoniliform, reaching basal third of elytra, and slightly dilated towards apices, segment 2 about as long as segment 4 and seven-eighths as long as segment 3, segments 7–10 each oval and nearly 1.5 times as long as wide, terminal segment the largest, longer than scape though about as wide as the latter.

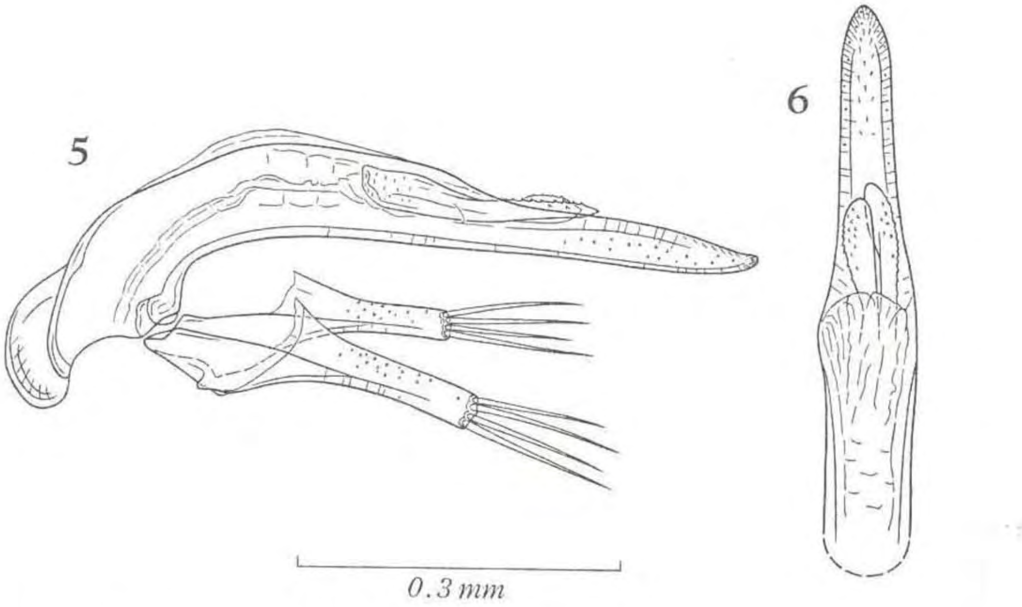
Pronotum small, subtrapezoidal, a little wider than head, wider than long, widest at five-sevenths from base, and more gradually narrowed towards base than towards apex;

PW/HW 1.20, PW/PL 1.26, PW/PA 1.31, PW/PB 1.37; surface moderately convex though more weakly so on the disc, sparsely covered with very short hairs, and devoid of discal setae; microsculpture formed by fine transverse lines; sides rather widely bordered throughout, moderately arcuate near front angles, less so behind apical two-fifths, briefly but distinctly sinuate at about basal eighth, and then slightly divergent towards hind angles; apex almost straight, with front angles narrowly rounded and not produced; base very slightly narrower than apex, PA/PB 1.05, very slightly emarginate at middle and very obliquely truncated on each side; hind angles distinct though obtuse, laterally produced as denticles; median line distinct, widened basad; apical transverse impression marked by longitudinal wrinkles; basal transverse impression mal-defined, laterally merging into large round basal foveae, whose bottoms are somewhat uneven; basal area narrow and rugulose.

Elytra oblong-subovate, much wider than prothorax, longer than wide in a similar proportion, widest at about five-ninths from base, and more gradually narrowed towards bases than towards apices; EW/PW 1.56, EL/EW 1.54; surface moderately convex at the sides and in apical parts, but depressed on the disc; microsculpture formed by fine transverse lines though partially degenerated; shoulders distinct, with prehumeral borders almost perpendicular to the mid-line; sides rather widely bordered, more widely reflexed before middle than behind, very feebly arcuate from behind shoulders to the level of the fifth umbilicate pore, and then gently arcuate to preapical emargination which is very slight; apices subtruncated, with a minute re-entrant angle at suture; striae entire, distinctly punctate, becoming shallower towards the side though even striae 7 and 8 are complete, striae 1–5 more or less deepening near base, 8 deepening behind the middle set of marginal umbilicate pores; scutellar striole deep and fairly long; apical striole short but deep, moderately curved anteriad, turned inwards and almost joining stria 3; intervals flat, each bearing an irregular longitudinal row of short erect pubescence; apical carina conspicuous; stria 3 with two setiferous dorsal pores at about basal fifth and slightly behind middle; marginal umbilicate pores nearly regular, though the first pore of the humeral set is somewhat isolated from the following three.

Ventral surface glabrous; prosternum with a few, fairly long hairs at the median part; each sternite with a pair of ordinary setae. Legs relatively stout; each protibia rather widely dilated towards apex and with a vestige of longitudinal groove on the external face; tarsi fairly stout, each protarsus with two proximal segments moderately dilated and inwardly denticulate at the apices in ♂.

Male genital organ relatively large and moderately sclerotized. Aedeagus about three-eighths as long as elytra, not flattened, almost straight in apical two-thirds, and abruptly bent ventrad at the basal part, which is small and moderately emarginate at the sides of basal orifice; sagittal aileron fairly large and elongate; apical lobe very long, nearly parallel-sided and blunt at the tip in dorsal view, slightly reflexed at the blunt extremity in lateral view; ventral margin almost straight in apical two-thirds in profile. Copulatory pieces long; left piece a little longer, though narrower, than the right, about one-third as long as aedeagus, lanceolate, and minutely tuberculose on the dorso-external face in apical two-fifths; right piece gently dilated in apical half and minutely tuberculose on the dorso-external face. Styles short and narrow, with slender apical parts, left style evidently longer than the right, each bearing four



Figs. 5–6. Male genitalia of *Oroblemus parvicollis* S. Uéno, sp. nov., from the Kumoishi-tôgé on the Oshima Mountains; left lateral view (5), and apical part of aedeagus, dorsal view (6).

stout setae at the apex.

Female unknown.

Type specimen. Holotype: ♂, 4–IX–1986, Y. Nishikawa leg. Deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Kumoishi-tôgé, 260 m in altitude on the ENE slope, above Kaminamarigawa, in Yakumo-chô of the Oshima Peninsula, in southwestern Hokkaido, Northeast Japan.

Notes. It is difficult to determine the true affinity of this interesting new species. Its locality is nearest to the type locality of *O. sparsepilifer* S. Uéno (1975, p. 115, fig. 1, 1983 a, pp. 159, 160), being about 129 km northwest of the latter. However, *O. parvicollis* differs from *O. sparsepilifer* in the size and shape of prothorax, above all in the configuration of its hind angles. *Oroblemus caecus* S. Uéno et A. Yoshida (1966, p. 80, figs. 1–2; Uéno, 1983 a, p. 159, 1985, p. 85, pl. 16, fig. 7) of Mt. Iwaki-san, which is about 171 km south by east of the Kumoishi-tôgé, is characterized by the dense pubescence covering the body surface and is much isolated in the genus. In many respects, the Hokkaido species resembles *O. subsulcipes* S. Uéno (1983 a, pp. 159, 160, figs. 1–3) and *O. dilaticollis* S. Uéno (1983 b, p. 18), both from the Japan Sea side of northeastern Honshu further 170 km south of Mt. Iwaki-san, but is evidently different from them in the absence of discal setae and the presence of minute hairs on pronotum. Besides, *O. parvicollis* is unique in the slender male genitalia, especially in the elongate apical lobe of aedeagus.

The unique type of this remarkable species was found in the very colluvium inhabited by *Epaphiopsis nishikawai*, but was dug out from its deepest part. Strictly speaking, therefore, it did not coexist with the latter. We made every effort to obtain some additional specimens by excavating likely colluvia in the gully, but without result.

Discussion

As was pointed out in the introduction of this paper, the two new trechine beetles described above may be regarded as endogean species, if the condition of their occurrence is not known. They are typically endogean in facies, and may possibly occur in endogean habitats at higher places, as is the case with *Epaphiopsis oligops* and *E. alloligops*. At lower places like the Kumoishi-tôgé, however, they have penetrated deeper into the upper hypogean zone and have successfully colonized there without undergoing appreciable modification of body form. Further investigations of the upper hypogean zone on the low mountains of the Oshima Peninsula will prove that this is usually the case with the anophthalmic trechines occurring in southwestern Hokkaido.

It was already elucidated in my previous paper (UÉNO, 1978, pp. 143–145) that the Japanese members of *Epaphiama* may have been derived from an ancestral species that had invaded southwestern Hokkaido from Primorskij Kraj by transmarine dispersal, and that the original immigrant may have become first differentiated into two ancestral species, prot-*oligops* and proto-*brevis*. *Epaphiopsis nishikawai* is an indubitable descendant of the former in view of the conformation of its male genitalia. Since the two related species, *E. nishikawai* and *E. oligops*, occur at the northern and southern parts of the Oshima Mountains respectively, their common ancestor, prot-*oligops*, must have widely spread over the non-volcanic mountains, and since the Kariba Volcanoes are inhabited by *E. alloligops* which is an indubitable descendant of proto-*brevis,* the Toshibetsu-gawa depression lying between the non-volcanic and volcanic areas must have served as a barrier to the dispersal of both prot-*oligops* and proto-*brevis*.

This inference accords well with the process of speciation surmised from morphological features. The two species occurring on the old non-volcanic mountains maintain relatively primitive features, though their eyes are reduced as the result of adaptation to the endogean life. This may mean that prot-*oligops* is older than or ancestral to proto-*brevis*, all the descendants of which possess apomorphic features of male genitalia and have become differentiated on recent volcanoes. Further speciation divided prot-*oligops* into two forms, northern and southern, which are now recognized as *E. nishikawai* and *E. oligops*, respectively.

Compared with the *Epaphiama* species, *Oroblemus parvicollis* poses a more difficult problem. Its ancestor must have come from somewhere in northeastern Honshu, since its congeners have previously been known mainly from the Japan Sea side of northeastern Honshu and one species each from the Shimokita Peninsula and the Island of Sado. It is, however, difficult even to decide whether the immigration of the ancestral trechine was effected on land or across the sea. As was explained in the preceding chapter, the true affinity of *O. parvicollis* is not certain, but I have the impression that it may have some relationship with *O. sparsepilifer* of the Shimokita Peninsula in spite of the marked difference in the size and shape of prothorax. If this were verified, my discussion would stand on a sounder basis. As it is, I cannot say anything for sure at the present moment.

Unlike that of the main part of Hokkaido, the carabid fauna of the Oshima Mountains consists of both the northern and southern elements. For example, it contains such notable northern groups as *Acoptolabrus* and *Pachycranion*, and at the same time, *Pterostichus mirificus*

H. W. Bates, which was formerly considered to be endemic to northeastern Honshu. Therefore, the peninsular mountains mark the southern and northern limits of distribution of these flightless carabids. The Tsugaru Straits seem to have formed an impassable barrier to the southward dispersal of the species of northern origin, but not to the northward dispersal of those of southern one. This is very strange, unless the dispersals in opposite directions took place at different times. Perhaps the northward invasion by southern species was effected across the straits, not on land, since the direction of the summer wind and other factors are in favour of the northward dispersal.

Oroblemus parvicollis is a flightless carabid of southern origin, and may have been derived from an ancestor that had crossed the Tsugaru Straits by sweepstakes dispersal. I have already pointed out that the ancestor of *O. katorum* may have crossed the Sado Straits through the agency of flood waters when the water gap was narrower than it is now (Uéno, 1983 a, p. 170). A similar way of dispersal may have been effected by the ancestor of *O. parvicollis*, but in this case, we cannot neglect the summer wind either as a potential carrier of the minute beetle.

要約

北海道には複眼の退化したチビゴミムシ類が少なく，これまでには，日高，夕張の両山脈と渡島半島から，地中性の種類が知られているにすぎなかった．1986年の夏に行なった現地調査で，渡島山地の地下浅層から，属の異なる2種のメクラチビゴミムシが発見された．これらは，形態的にみると地中種の範疇に入るが，生息場所は深くて，洞窟種の生息域に含まれる．いずれも新種と認められたので，次の新名を与えて記載した．

ニシカワチビゴミムシ *Epaphiopsis (Epaphiama) nishikawai* S. Uéno

オシマメクラチビゴミムシ *Oroblemus parvicollis* S. Uéno

ニシカワチビゴミムシは，国内での分布域が渡島半島に限られるキタチビゴミムシ亜属 *Epaphiama* に属し，センゲンチビゴミムシ *E. oligops* S. Uéno に近縁である．これらの2種が渡島山地の固有であるのに対して，利別川以北の新しい火山には，より進んだ形質をもつ種類のみが分布している．このことからみて，狩場山やニセコなどに分布する系列の種類は，渡島山地のものより新しく分化したと考えてよかろう．

オシマメクラチビゴミムシの方は，これまで東北地方と佐渡のみに分布の知られていたキタメクラチビゴミムシ属 *Oroblemus* に属するが，かなり孤立した特徴をもち，真の類縁関係が明らかでない．しかし，本州側から津軽海峡を越えて渡島山地に侵入した祖先型に由来することは確かである．この型の拡散が，陸地伝いに行なわれたのか，それとも洪水や風の力で海峡越しに行なわれたのか，を判定するのはむずかしいが，北海道の中でも渡島山地だけに分布する，本州起源のゴミムシ類があることは，生物地理学的にみて注目に値する．オシマメクラチビゴミムシもその一例である．

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